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THE NEW GENERATION OF NUCLEAR WEAPONS

by Stephen Daggett

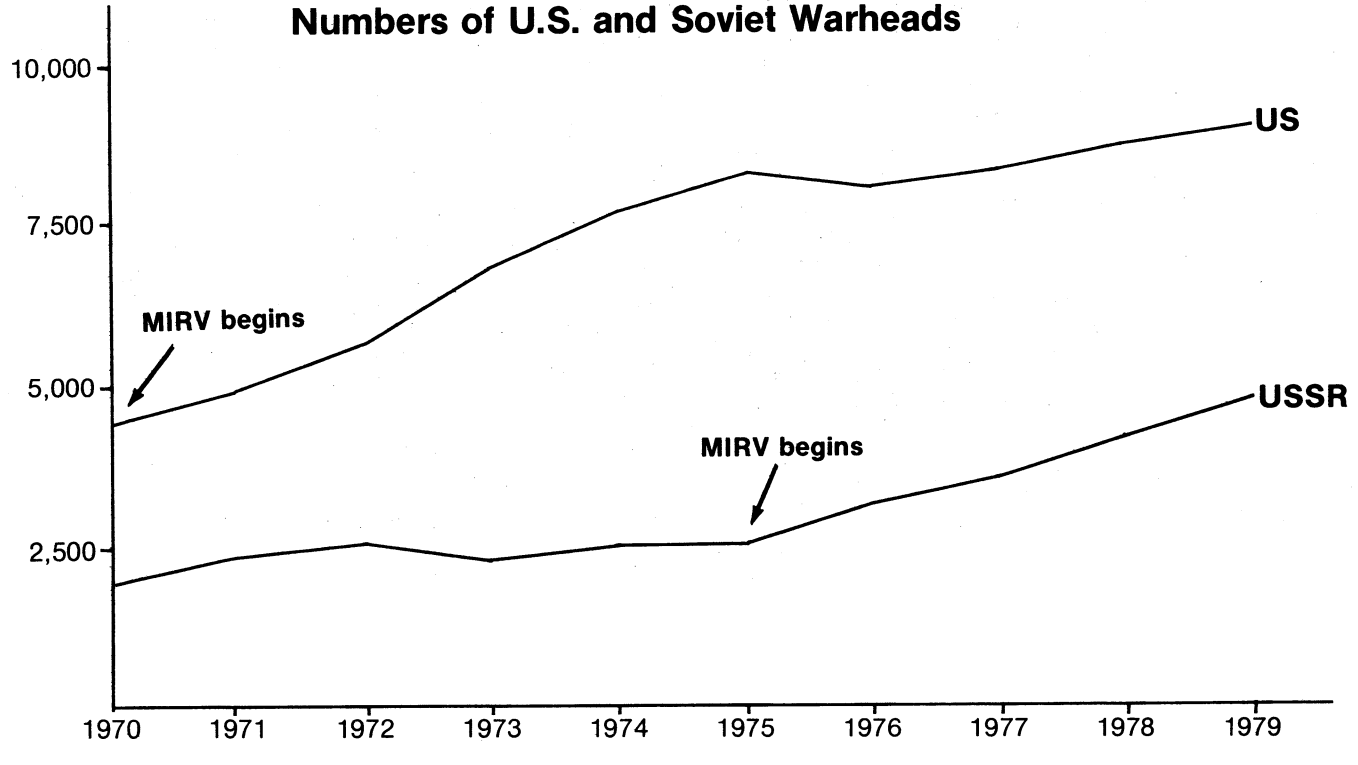
Since 1969, the United States and the Soviet Union have been engaged in negotiations to limit the nuclear arms race. Despite the continuing Strategic Arms Limitation Talks (SALT), however, both sides have added substantially to their nuclear weapons arsenals. The U.S. now has over 9,000 nuclear warheads on its missiles and bombers and the Soviets have almost 5,000. In 1970, the U.S. had about 4,000 warheads and the Soviets 1,800.

This quantitative acceleration of the arms race, however, is far less important than major *qualitative* changes in the weapons both sides are putting in place. Both the United States and the Soviet Union are developing and deploying a *new generation of nuclear weapons.* Taken together these new weapons are fundamentally changing the nature of the nuclear balance between the two superpowers.

Most of these new systems are *counterforce* weapons—they are accurate and powerful enough to destroy even blast-hardened military sites, like missile silos and command bunkers. Because they can be used to destroy all or part of the enemy's nuclear retaliatory force, they draw into question the principle of "Mutual Assured Destruction," or "MAD," which had governed U.S. strategic policy since the mid-1960's. MAD asserted that each side would be deterred from attacking the other because even after absorbing a nuclear attack, either nation would retain enough of its force to deliver devastating retaliation. The development of counterforce weapons raises the possibility that they will be used in a limited way, to attack only military sites, or that they will be used in an effort to "win" a nuclear war by crippling all or part of the other side's retaliatory force before it can be used.

Counterforce technologies, therefore, are intended to make nuclear weapons more useable and, thus, to make nuclear war fighting "thinkable." The idea is that nuclear attacks can be directed solely at military targets without necessarily doing extensive damage to civilians.

This pamphlet briefly describes the most important members of the new generation of nuclear weapons both in the United States and in the Soviet Union. But more than that, it tries to give some sense of what the development of these counterforce weapons means by reviewing both Soviet and American strategic nuclear doctrine, and by briefly discussing the impact of new developments on the strategic nuclear balance.



U.S. Strategic Nuclear Doctrine

U.S. officials have always presented deterrence as the goal of U.S. strategic policy. What is to be deterred, however, has been defined rather ambiguously and sometimes quite broadly, and has changed with the nature of the military threat the U.S. has perceived. At times the United States has looked to nuclear weapons as virtually a first line of defense, threatening to initiate their use immediately in response to almost any conventional attack on itself or its allies. At other times the United States has seen nuclear weapons as a last resort, to be threatened or used only when other means of defense have failed. Often U.S. strategic doctrine has been a matter of intense debate and disagreement. The subject, therefore, is unclear and complex. What follows is only a brief review of some of the most important statements of U.S. strategic doctrine.

Massive Retaliation: In 1954, Secretary of State John Foster Dulles announced the doctrine of "Massive Retaliation" by which the United States would respond to any major attack on itself or its allies with a massive nuclear attack on the U.S.S.R.'s cities and industrial centers. The U.S. relied on its virtual monopoly on deliverable nuclear weapons to deter even conventional attacks. The Massive Retaliation doctrine downgraded the importance of U.S. conventional military strength in favor of a nuclear defense.

Flexible Response and Graduated Response: By the time the Kennedy Administration came into office in 1961, the Soviets had begun to develop their own intercontinental nuclear delivery systems. At the same time, Administration officials were convinced that nuclear weapons were not useful in confronting the major military threats facing the U.S., especially the threat of communist-led insurgencies in the Third World. The Pentagon, under Secretary of Defense Robert McNamara, therefore announced the policy of "flexible response" by which the U.S. would confront any military threat with a relatively limited retaliation appropriate to the level of conflict beginning with "conventional" (non-nuclear) weapons and forces. On the nuclear level a policy of "graduated response" meant that the U.S. would avoid using nuclear weapons as long as possible and then would escalate step by step from the limited use of tactical nuclear weapons to full scale strategic nuclear warfare. The U.S. hoped, thereby, to keep the threat of nuclear weapons credible, despite Soviet ability to attack the U.S. itself.

Damage Limitation: In a commencement address in Ann Arbor, Michigan, on June 16, 1962, Secretary McNamara announced that the U.S. was considering (though it never formally adopted) a "damage limiting" nuclear strategy. "Damage limitation" meant that the U.S. would try to control a nuclear war to prevent attacks on U.S. cities. The U.S. would refrain from attacking Soviet cities in return for similar Soviet

Harold Brown, Secretary of Defense

restraint, and, after a first nuclear exchange, the U.S. would target remaining Soviet nuclear weapons in order to prevent their being used against American population centers. Because the policy envisioned attacking Soviet military forces, it was the first explicit "counterforce" doctrine. At the time, however, the policy was clearly unworkable. The Soviets loudly proclaimed that they would follow no such "rules" for keeping a nuclear war limited, existing U.S. weapons were too inaccurate to destroy protected Soviet ICBMs, and Secretary McNamara soon dropped the term. U.S. strategic plans did focus on military targets, but McNamara rejected military proposals for new weapons to implement a full scale counterforce approach.

Mutual Assured Destruction: MAD, as it was called, became the official U.S. doctrine during most of the 1960s and into the early '70s. MAD asserted that either side would be deterred from starting a nuclear war by the certain knowledge that, even after absorbing a nuclear first strike, the other side could launch a devastating retaliatory attack. Thus, it led to an emphasis on deploying large numbers of well protected nuclear weapons systems. Mutual Assured Destruction is intended to assure "stability" in the

The Triad of Strategic Nuclear Weapons

The U.S. and the Soviet strategic arsenals both comprise a three-legged **Triad** of forces based on land, on sea and in the air.

The land leg—is made up of intercontinental ballistic missiles (ICBMs). Currently all American and Soviet ICBMs are buried in concrete underground silos able to protect the missile from all but a direct hit from an atomic explosion. The U.S. now has 1054 ICBMs and the U.S.S.R. has 1398.

The sea leg—includes nuclear powered submarines carrying submarine-launched ballistic missiles (SLBMs). The U.S. has 41 submarines carrying 656 missiles. The U.S.S.R. currently has 62 submarines with 950 missiles.

The air leg—is made up of intercontinental bombers which deliver gravity bombs or air-to-ground missiles. The U.S. has 348 "B-52" bombers, and the U.S.S.R. has 140 "Bear" and "Bison" bombers.

nuclear balance, in that neither side can gain any significant advantage over the other by attacking first. MAD rests on a nuclear balance of terror in which any attack would serve only to draw a retaliatory strike from the other side and would therefore be suicidal. This is precisely the opposite of damage limitation, and in the interest of preserving Mutual Assured Destruction, the U.S. pursued the SALT I agreement, signed in 1972, which included the Anti-Ballistic Missile (ABM) Treaty prohibiting active defense against incoming missiles.

Counterforce Options: Beginning in 1973, successive U.S. Secretaries of Defense have moved the U.S. more and more away from Mutual Assured Destruction and toward a counterforce strategy. In his Annual Report to Congress for Fiscal Year 1975 (delivered in January of 1974), Secretary of Defense James Schlesinger called for providing the President with a wide variety of options, including limited attacks on hardened Soviet military sites. Schlesinger wanted the U.S. to be able to fight limited, controlled, nuclear wars, and he called for a form of "damage limitation" by advocating "intra-war deterrence"—that is, deterring attacks on population centers even in the midst of nuclear war. In his FY 1978 Report Secretary of Defense Donald Rumsfeld went further, calling for "more than limited hard-target kill capability." Rumsfeld was concerned that the U.S. not appear to have less counterforce strength than the Soviet Union.

More recently, Secretary of Defense Harold Brown has called for a "countervailing strategy" by which the U.S. will be able to counter any Soviet threat with as limited or as massive a response as is judged necessary. The U.S. will aim at a whole range of target options, including Soviet cities, industrial centers, military staging areas, and ICBMs, and the President will be able to orchestrate a nuclear attack very precisely.

A Pre-emptive First-Strike Capability: American officials have always claimed that it will never be possible for either the U.S. or the Soviet Union to launch a totally effective pre-emptive first-strike, and Secretary Brown has denied that the United States is pursuing such a capability. A disarming first strike would require destroying enemy ICBMs in their silos, locating and destroying enemy missile submarines, and then defending against the few missiles which would escape attack. It is true, nonetheless, that the Pentagon is aggressively developing all of the technologies—including missile accuracy, Anti-Submarine Warfare, and Ballistic Missile Defense—needed to carry out a pre-emptive first strike. Secretary Brown has said that by the mid- to late-1980s, the U.S. will be able to cover every Soviet land-based missile "with at least one reliable warhead with substantial capability to destroy the target." Moreover, several recent reports from outside the Pentagon have pointed to tremendous U.S. advances in submarine detection technology—advances which could allow the U.S. to locate and then destroy Soviet missile submarines before they could fire their missiles. The United States has always continued research funding for Ballistic Missile Defense, and now some Pentagon officials are calling for Anti-Ballistic Missile systems to protect M-X sites—this would provide a foot in the door for selling a more complete ABM system. Official U.S. policy statements do not openly assess these developments.

Summary

U.S. strategic doctrine has shifted rapidly toward counterforce approaches in recent years, and the U.S. has directed its weapons development programs toward systems which fit into various counterforce options. Within the next couple of years the Pentagon will have in place both the weapons and the plans necessary for fighting a carefully controlled, slowly escalating, limited nuclear war. Thus, the President will have the ability to follow James Schlesinger's strategy of "limited counterforce options." Secretary of Defense Harold Brown wants to move beyond that. His "countervailing strategy" has not yet formally been accepted by the President, but all of the planning decisions necessary to implement it have been approved. The development of all the systems planned for this policy together with improvements in strategic anti-submarine warfare capabilities already being implemented, will move the U.S. very far in the direction of a pre-emptive first-strike posture. This will be true even if the Soviets develop their own mobile missile (like the M-X). Repudiation of the Anti-Ballistic Missile (ABM) Treaty would be a final step toward a very threatening pre-emptive capability. It will never be possible for U.S. strategists to count on this system's being effective (see the discussion of counterforce above); but it would certainly lead to a Soviet response which would further drive the arms race and make the nuclear balance very fragile during any political crisis.

Soviet Strategic Policy

Soviet strategic policy diverges from American doctrine in a number of important ways, reflecting differences in the history of the two countries, the very different military threats which they face, and their different strategic capabilities. Soviet strategic planning is in the hands of the military leadership rather than of civilian strategists. Since the job of the military is to plan for war, Soviet statements of policy reflect the professional military concern with waging war rather than the contingency planner's concern with the psychology of deterrence. This does not mean that the Soviets neglect the value of deterrence, but they tend to treat it as following from military strength rather than as a security issue in itself. The best guarantee of peace, they say, is the Soviet military strength.

Soviet military writers recognize that nuclear war would be a horrible catastrophe. They stress that a nuclear war would be far more devastating even than World War II, and that tens of millions of people would die. Thus they repeat that nuclear war is unacceptable, and that the only alternative is the peaceful coexistence of states with different social orders and, eventually, complete nuclear disarmament. At the same time, they deny that nuclear war is therefore impossible, unthinkable, or strictly suicidal. Any war, they argue, arises out of political and economic conflict—conflicts which do not disappear with the development of nuclear weapons. It is the obligation of the Soviet military, they conclude, to prepare to fight wars, including even a nuclear war.

In addition, the Soviets do not put much stock in any Western notion of keeping a nuclear war limited. In part, this follows from their belief that all wars arise out of political contradictions. Most Soviet writers argue that any political confrontation serious enough to lead to the use of nuclear weapons could not be resolved through diplomatic compromise—a nuclear war would end, therefore, only when one side was no longer able to carry on the battle. Soviet strategy therefore combines a stress on military preparedness to fight a nuclear war with an emphasis on full-scale conflict. Text books point up the advantages to be gained, even in a nuclear war, from a massive attack on the enemy's military forces designed to disrupt the ability to respond in an effective and coordinated way. Tacticians especially stress the shock value of a sudden, concerted attack on the other side's command and control systems.

To American strategists, this makes for some hair-raising reading, and inspires visions of a Soviet design to gain a "nuclear war-winning" capability. Some American theorists have gone so far as to argue that the Soviet military is unreconciled to nuclear deterrence and seeks a decisive military advantage, and that the U.S.S.R. would be willing to use any military advantage to push for political concessions from the West even at the risk of nuclear war. There is, however, little support for this analysis in Soviet military writing. The Soviet doctrine that war is fought for political ends implies quite the opposite conclusion from the view that the threat of nuclear war could be used to gain some marginal political advantages. About all that can be concluded from Soviet military writing is that the Soviets take planning for nuclear war very seriously, and assert that they will resort to nuclear war if necessary to protect what they regard as their vital interests. Soviet leaders have repeatedly denied that they are seeking military superiority.

At the same time, it is true that their planning for war makes the Soviets relatively insensitive to Western concerns about maintaining the stability of the nuclear deterrent balance, though lately, the Soviets have recognized that there may be some dangers in an unrestrained counterforce race. Because the Soviets are much more dependent than the U.S. on land-based missiles, they have been very distrustful of American efforts to limit the deployment of counterforce weapons. Accurate, powerful land-based missiles are

'Great news! We've inflicted unacceptable damage on the other side.'

Auth in The Philadelphia Inquirer

the one area of strategic competition in which the Soviets have been able to compete effectively with the United States, and they understandably see any effort to constrain these systems as one-sided. This is especially true in light of American advances in anti-submarine warfare technology, in the development of highly accurate submarine launched missiles (the Trident II), and in the development of air-launched crise missiles. It has proved very difficult, therefore, to obtain Soviet agreement to deep cuts in nuclear arsenals which might constrain the evolving counter-force race.

In fact, arms reduction does not seem to have been a high priority for the Soviets in the SALT negotiations. The Soviets have been concerned instead to assert military and thus political parity with the U.S., and so they have sought relatively limited, achievable bargains in the belief that this certifies their superpower status. They seem to expect that qualitative arms competition will continue and that each side logically will try to plan its forces so as to prevail if a war occurs, despite their efforts to avoid it. The Soviets, then, are not likely to lead the way in negotiating limits on the "war-fighting" capabilities of both sides.

A Glossary of Terms

The world of strategic military policy is a world of acronyms, shorthand expressions, and of complex efforts to measure the effectiveness of weapons. A number of acronyms and technical terms used repeatedly in the text are defined here:

KINDS OF MISSILES:

ICBMs: Intercontinental ballistic missiles are long range rocket powered missiles set off from silos buried in the ground. These are *land-based* missiles.
SLBMS: Submarine-launched ballistic missiles are set off from missile launch tubes on submarines from underwater. They are generally smaller and shorter than ICBMs, and do not travel as far.

CRUISE MISSILES:

ALCMs: Air-launched cruise missiles.
SLCMs: Sea-launched cruise missiles, and
GLCMs: Ground-launched cruise missiles—all are small, pilotless missiles which fly like airplanes and are powered by jet engines which take in air from the atmosphere rather than by rocket engines which carry their own oxidizing agent.

MISSILE PAYLOADS:

Single warhead missiles carry one nuclear weapon each on the tip of the missile. The weapon itself is carried in a "reentry vehicle" or "RV," in which it returns to the atmosphere after its brief trip into space.
MRVs are "Multiple Reentry Vehicles"—separate warheads carried into space by a single rocket, which then reenter the atmosphere separately, though they are aimed at the same target.

MRVs as well as MIRVs and MARVs are carried during the middle portion of flight by a "post-boost vehicle" or "PRV" from which they are fired off at their targets.

MIRVs are "Multiple Independently-Targetable Reentry Vehicles," carried into space together by the same rocket engine, but then fired off along the way from the PBV at separate targets below—thus, they are "independently targeted."

MARVs are "Maneuverable Reentry Vehicles" which like MIRVs, are aimed at separate targets, but which can also change direction at the end of a flight either to confound enemy defenses or to home in on a target more precisely.

MEASURES OF MISSILE CAPABILITIES:

The **throwweight** of a missile measures the total weight of the weapons, guidance equipment, and postboost vehicle which a missile can lift.

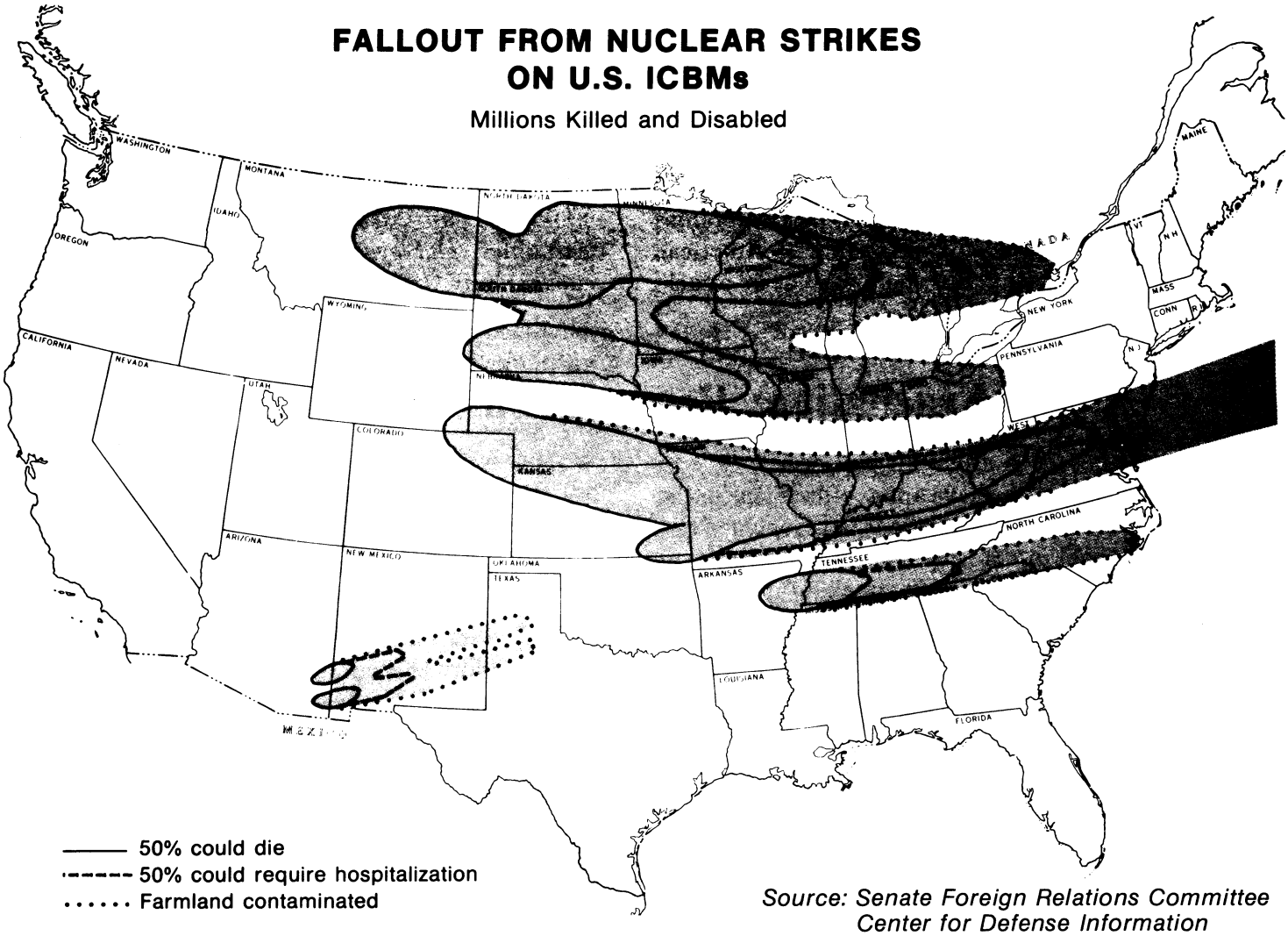
The **yield** or explosive power of a nuclear warhead is measured in kilotons or megatons. One **kiloton** is the explosive power of 1,000 tons of conventional explosive like TNT. One **megaton** equals the power of one million tons of TNT. The bomb which destroyed Hiroshima was about 13 kilotons. The smallest U.S. strategic bomb today is 40 kilotons, and the largest is 20 megatons.

The **accuracy** of a missile is measured by the **CEP** or "Circular Error Probable" for each warhead. The CEP measures the radius of a circle within which one-half of the warheads aimed at the same point are expected to land. If the CEP is 600 feet, for example, half of the warheads would be expected to land within 600 feet of the target.

It is possible, knowing the yield and the CEP of a warhead, to estimate the likelihood that a single shot will destroy the target it is aimed at, given how "hard" the target is. In all the estimates made here, it is assumed that targets have been hardened with concrete sufficiently to resist 2,000 pounds per square inch of pressure from an explosion.

FALLOUT FROM NUCLEAR STRIKES ON U.S. ICBMs

Millions Killed and Disabled



Source: Senate Foreign Relations Committee
Center for Defense Information

The Nature of Counterforce

A counterforce strategy is one in which nuclear attacks are directed against the military *forces* of the other side (thus counter*force*) rather than against the cities or industrial capacity of the enemy nation (a counter*value* strategy).

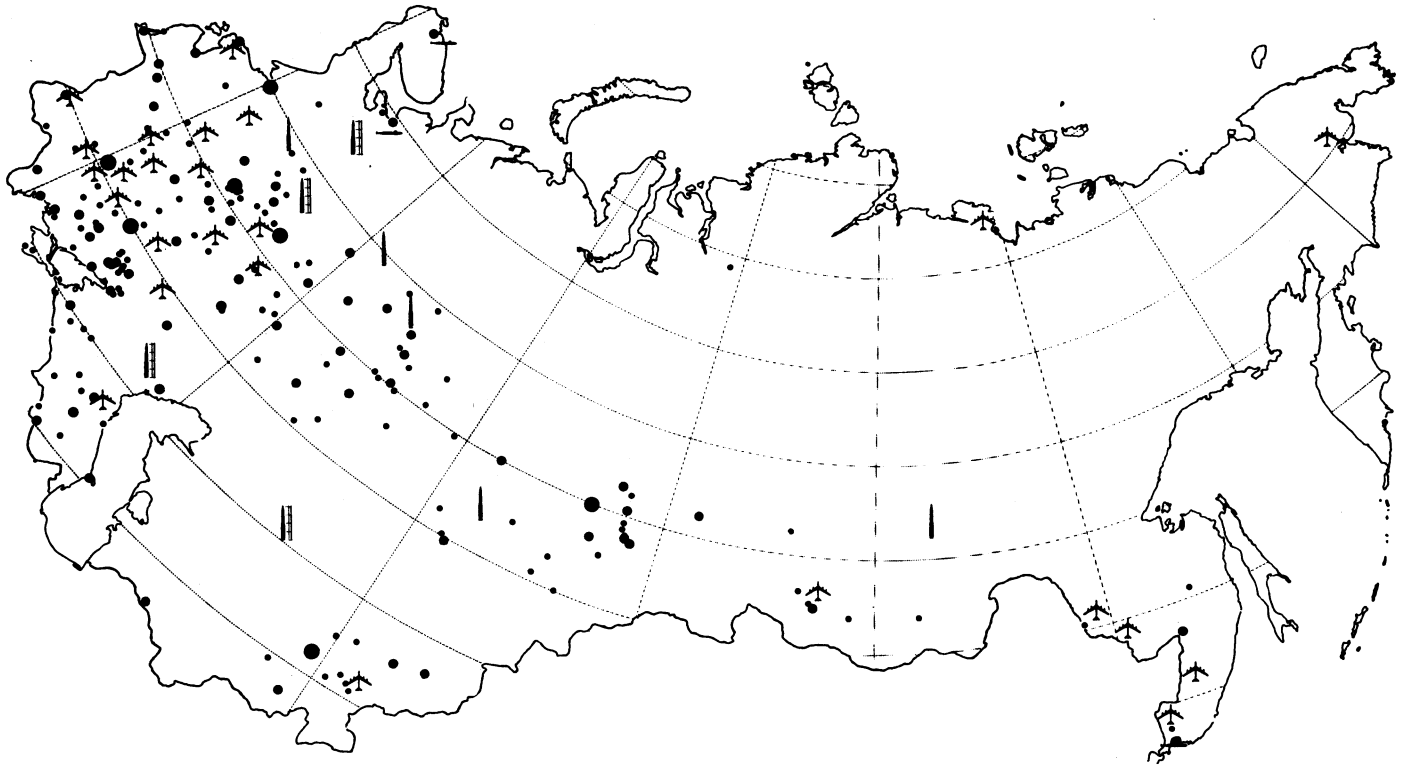
In the past, because they cause massive destruction and have potentially horrible long-term effects, nuclear bombs have been seen primarily as countervalue weapons, and their use has been regarded as only a final, extreme and almost unthinkable measure. This is true even though military policymakers have not generally planned to destroy civilian targets as such. Because the effects of nuclear weapons could not be kept limited, even attacks directed only at strategically significant sites would do extensive "collateral" damage to "value" targets as well. And, in order to reinforce the effectiveness of nuclear weapons in deterring an attack from the other side, civilian leaders both in the United States and in the Soviet Union, have always stressed the indiscriminate destructive potential of their nuclear arsenals.

Development of the new generation of nuclear weapons, however, has been accompanied by a resurgence of planning for strictly counterforce strategies. The new nuclear systems are so accurate that they might be used to attack only strategic military targets like enemy missile silos, nuclear stockpiles, and command and control centers. Though such counterforce scenarios are taken quite seriously by some strategic planners, they must be seen in any realistic sense as preposterous.

First, a "counterforce" attack designed, for example, to take out the enemy's land-based missiles would immediately kill tens of millions of people and would cause incalculable long-term death and destruction through radiation poisoning, effects on the atmosphere, and other carry-overs.

Second, even in strictly military terms, the prospects of a "counterforce" attack accomplishing its objectives are so doubtful that no rational political leader could count on it. No one knows whether missiles shot off under ideal test conditions will perform reliably in wartime—the United States, for example, has never

Strategic Military Targets Inside the U.S.S.R.



test-fired a Minuteman missile directly out of a silo. No one knows how accurate missiles will be in untested flight paths over the North Pole. No one knows what effect hundreds or thousands of nuclear explosions will have on incoming warheads—it is quite likely that warheads will be destroyed before they reach their targets by the "fratricide" effect of explosions from other incoming weapons. Military planners cannot assume that the enemy nation will not simply launch its missiles "on warning" of attack, before they can be destroyed. And finally, no political leader would order a "counterforce" attack without expecting that the other side would retaliate in some way with its remaining nuclear forces.

The danger from counterforce planning, however, is that, like other military "contingency" plans, it may take on almost a life of its own, especially in a crisis situation. The very logic of counterforce planning creates its own perils. For one thing, limited counterforce nuclear attacks might appear to be merely an extension of conventional warfare, giving the side willing to use nuclear weapons a potentially decisive advantage in a desperate military situation. Counterforce weapons therefore lower the threshold between conventional and nuclear war.

Second, counterforce strategy might be aimed at trying to "win" a nuclear war by crippling all or part of the enemy's nuclear force before it can be used. By their very nature, counterforce weapons can be used not only for deterrence, but to launch a preemptive first strike attack—*they are offensive weapons, not defensive ones.* This has two effects: first, it undermines deterrence because the side which attacks first gains an advantage; in a crisis, therefore, either side is more likely to launch its own attack before the enemy does, or to launch its missiles "on warning" of attack, increasing the danger of a mistake. Second, it creates distrust about the other side's intentions. This feeds the arms race as each side strives to gain relative superiority and to find ways, however costly, to make its own missile force less vulnerable.

New Theater Nuclear Weapons

Soviet President Brezhnev's recent offer to reduce the number of Soviet nuclear weapons targeted on Western Europe in return for a NATO decision against stationing 572 new American nuclear weapons there has generated a tremendous furor over the "Eurostrategic" nuclear balance. The political factors involved, as well as the large number and variety of nuclear-capable aircraft and missiles under the control of a number of different nations makes the question too complex to consider here in any detail. Still, systems intended for use in the European theater, although often referred to as tactical nuclear weapons, are just as powerful and destructive as any of the bombs in American or Soviet strategic arsenals, and the new Eurostrategic weapons raise many of the same problems as the new generation of strategic nuclear arms.

The Soviet SS-20 and Backfire Bomber

The American proposal to build up NATO's nuclear arsenal is being justified as a response to the Soviet deployment of the SS-20 Intermediate Range Ballistic Missile (IRBM) and the "Backfire" bomber. The SS-20 is a two stage, solid-fueled rocket, which can be transported on a tracked mobile vehicle, though little is known about its exact design. The SS-20 has three MIRVed warheads and a better than 2500 mile range, which means that it can reach any target in Western Europe from launch sites deep inside Soviet territory. The SS-20 is not as accurate as other new Soviet strategic missiles, but there are few hardened targets in Western Europe anyway. The main advantage of the SS-20 over its predecessor SS-4 and SS-5 missiles is that it is mobile and therefore cannot easily be destroyed by a preemptive strike from the west. The Soviets now have about 120 SS-20s of which 90 are aimed at Europe and the rest at China.

The Soviets also assign about one-third of their fifty new Backfire-B bombers to European operations. The Backfire is a supersonic bomber capable of penetrating air defenses at a low level to deliver five atomic bombs. There has been some dispute as to whether the Backfire could carry out a one-way, or, if refueled, a round trip attack on the United States itself. Certainly, the Backfire was not designed for that purpose and probably could not play such a role effectively. All Soviet Backfires currently are based in locations and carry equipment which indicate that they are assigned to naval or to theater operations in Europe and Asia. The Soviets agreed in SALT II not to base Backfires in locations appropriate for attacks on the United States and to limit production of the Backfire to 30 planes per year.

The U.S. Pershing II and GLCMs

The United States has proposed to its NATO allies putting 108 new Pershing II Medium Range Ballistic Missiles (MRBMs) and 464 Ground-Launched Cruise Missiles (GLCMs) in Europe beginning in 1983. The Pershing II is to be a 1000 mile range, single-warhead missile. From sites in West Germany, Belgium, the Netherlands, and Italy, it can reach targets in the Western Soviet Union as well as in East Europe. Small Ground-Launched Cruise Missiles (described in more detail in the section on cruise missiles) can be fired off from four-tube launchers on very mobile tractors. Even from stations in Great Britain, they will be able to reach targets inside the U.S.S.R.

Other "Theater" Weapons

Besides the SS-20 and the Backfire, the Soviets have a number of new "nuclear-capable" supersonic fighter bombers, about 450 older medium range bombers, submarine-launched missiles, short range (500 miles) ballistic missiles, and almost 600 older medium and intermediate range land-based missiles in their inventory. The SS-20 is intended to replace some of these older missiles.

The United States and its allies (Britain and France produce their own nuclear weapons) display a similar array of weapons for use against the East, though the NATO arsenal includes as well a number of carrier-based fighter/bombers from the U.S. Sixth Fleet in the Mediterranean. The U.S. force of 66 FB-111A and 78 F-111E and F-111F fighter/bombers assigned to nuclear roles in Europe currently outnumbers the Soviet Backfire force, and, with supersonic, low altitude capabilities and complex electronics, F-111s are about as capable as the Backfire. Each FB-111A can carry four bombs and each F-111E or F can carry three.

The Political Issue

F-111's, a few French missiles, French, British and American submarine-launched missiles, and some U.S. carrier-based aircraft already can reach targets inside the Soviet Union. The Soviets agreed to consider neither allied weapons nor American "Forward Based Systems" in the SALT talks in one of their earliest major concessions. The Soviets therefore have some basis for complaining that the U.S. proposal to put 572 new nuclear weapons systems into Europe violates the spirit if not the substance of SALT. The difficulty is that these new medium range American systems threaten the Soviet Union itself, while such new Soviet systems do not threaten the United States. The GLCMs are also prohibited by the protocol to the SALT II treaty. The protocol expires in 1981, and there are no limits on cruise missile deployment after that time, but the Soviets again have a strong basis for complaining that to plan GLCM deployment without even negotiating the issue violates the spirit of the agreement. This is especially true because cruise missiles, which are very small and could easily be hidden, create serious problems for verification of any future arms control agreements.

The New Generation of American Nuclear Weapons:

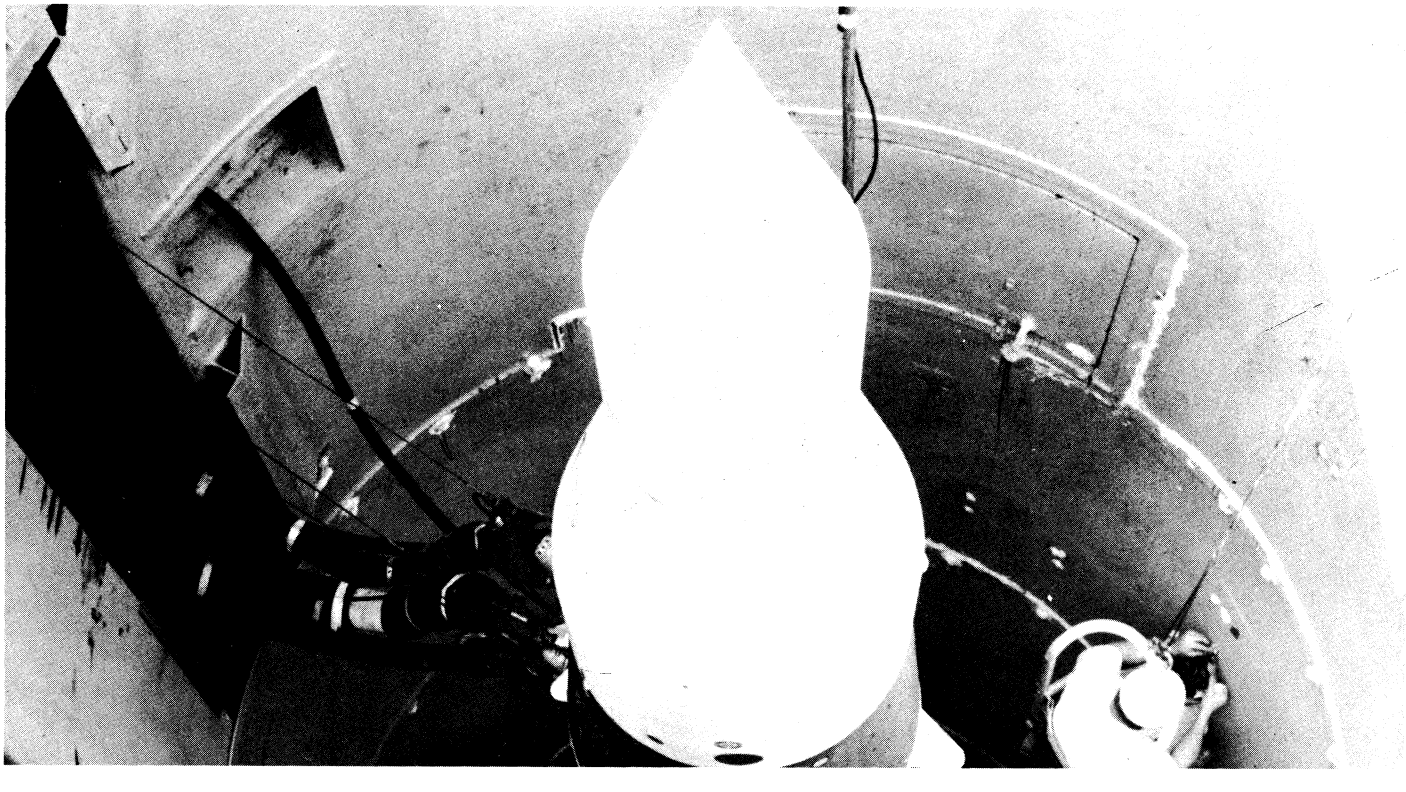
U.S. Minuteman Improvements

Since 1966, the U.S. land-based missile force has consisted of 1,000 Minuteman Missiles and 54 older, very large Titan II missiles. The first Minuteman was put in place in 1962. But this does not mean that the U.S. ICBM force has stood still since the last Minuteman was put into the ground. On the contrary, the U.S. has constantly upgraded the quality of the Minuteman force, even leading the way into entirely new areas of the arms race. The Air Force has made some fifteen major changes in Minuteman Missiles ranging from installing new nuclear warheads and guidance systems, to using new fuels—the physical design has been changed three times. Beginning in 1970, the United States began putting MRVs and then MIRVs on new, larger Minuteman-3 missiles, five years before the Soviets followed with their first MRVs.

Presently the U.S. has 450 Minuteman-2 missiles, each with one 1-2 megaton warhead, and 550 Minuteman-3s, each with three 170 kiloton MIRVs. Recently, the United States has been improving the Minuteman-3s substantially. All 550 Minuteman-3s have just been fitted with a new precision guidance system which can deliver each warhead within 600 feet of its target. Further, by 1981, 300 of the Minuteman-3s will have been fitted with new *Mark-12A* warheads with 350 kilotons of explosive power—double that of the Mark 12 warheads now on the missiles. These new warheads are at least as effective as the most advanced Soviet ICBMs as counterforce weapons. Mark 12A warheads with an average 600 foot accuracy can destroy 70% of the missile silos they are aimed at. With improvement in accuracy to 300 feet, which is expected before 1985, Mark 12A warheads will have a 98% "kill probability." These Minuteman missiles are designed primarily for fighting limited nuclear wars.

All of the Minuteman missiles carry five target options in their computer systems, and any one of these options can be selected almost instantly. In addition, all of the Minuteman missiles have been integrated into the "Command Data Buffer system" which allows each missile to be retargeted within 30 minutes. Thus, they can be used to respond quickly to changing contingencies in the midst of a war, as part of the Pentagon's policy of "limited counterforce options."

A Minuteman-3 missile in its silo. (U.S. Air Force photo)



The M-X "Blockbuster" Missile

Perhaps the most important member of the new generation of nuclear weapons in the United States is the M-X (Missile-Experimental). The battle over the M-X is already shaping up as one of the most crucial military issues facing the United States.

The M-X program has two elements. The first, and one which has received the most attention, is the effort to preserve the land-based leg of the U.S. strategic triad by finding a "basing mode" which will make land-based missiles less vulnerable to attack by Soviet ICBMs. The second and equally important element is the effort to build a new powerful and deadly ICBM which will put Soviet land-based missiles in jeopardy.

Since 1966, the Pentagon has considered some twenty-five different schemes to protect land-based missiles, ranging from building twenty-five mile long tunnels in which to hide each missile, to a "shell-game" strategy in which a single missile would be moved secretly among a number of missile silos, to an "air mobile" system to fly individual missiles around from one small airfield to another. Last year the President finally approved the so-called "race track" scheme for putting each of 200 M-X missiles and transporter vehicles on an elliptical roadway from which 23 spurs lead to shelters in which to hide the missile. Now the Pentagon has revised even this plan to replace the race tracks with "linear grids" of straight roads. The effect of the system remains about the same. To be sure of destroying all the missiles, the Soviets would have to target each of the 4600 shelters with one or two warheads. Planners argue that this would so deplete the Soviet arsenal that they would put themselves at a military disadvantage by striking first. The U.S. would show the Soviets that only 200 missiles were deployed by periodically opening up all of the shelter tops and assembling only one missile in each "race track" area.

The missile itself has been explicitly designed as a powerful counterforce weapon. It will be 71 feet long and 92 inches in diameter and will weigh three times as much as current U.S. Minuteman missiles. Each M-X will carry ten warheads, the maximum allowed under SALT II. The Pentagon plans to use the Mark 12-A 350 kiloton warhead on the M-X, though there is some talk of using instead a 500 kiloton warhead which has already been tested. By 1986, when the first M-X is to be put into place, it is predicted that the accuracy will have improved to 300 feet. Thus, 200 M-X missiles will give the U.S. as many as 2,000 more warheads, each with better than a 95% chance of destroying a Soviet missile in its hardened silo.

The effort to preserve the land-based leg of the triad is intended above all to give the U.S. the ability to

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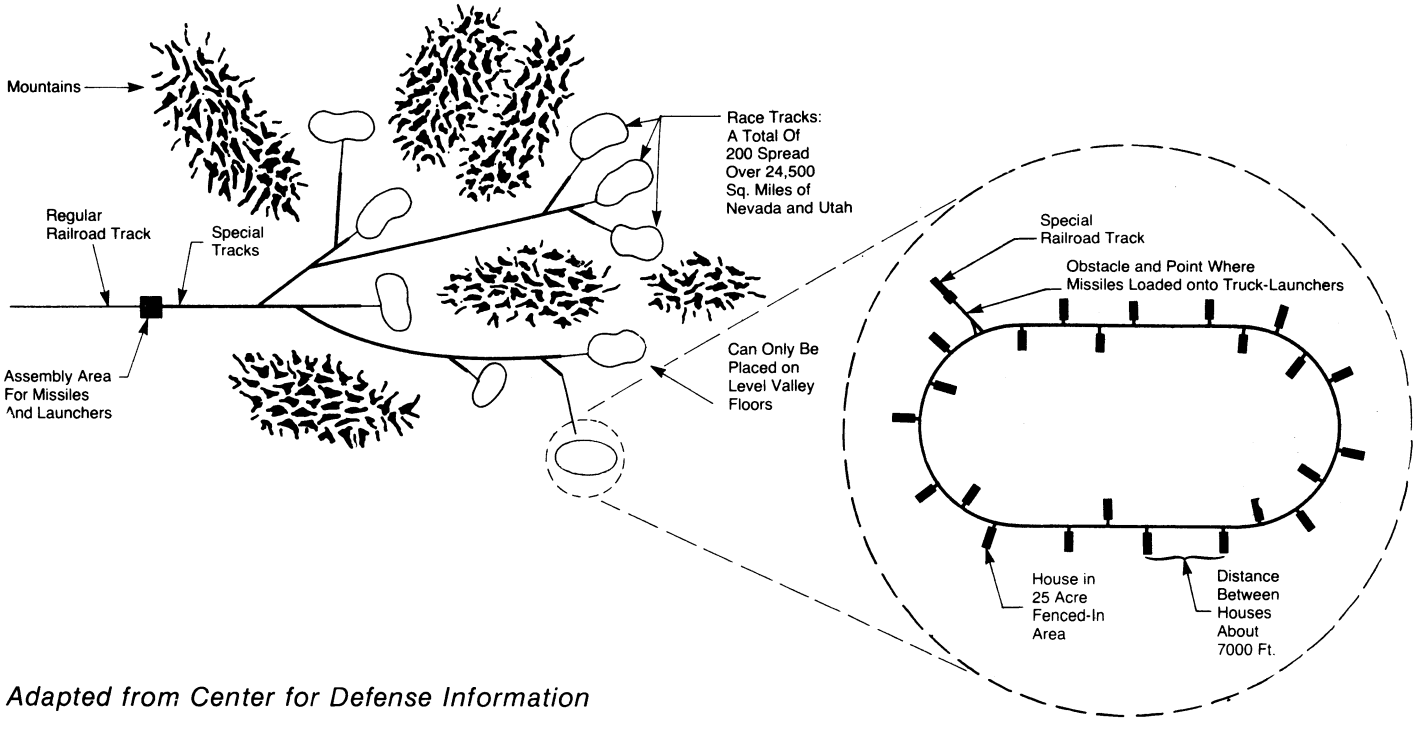
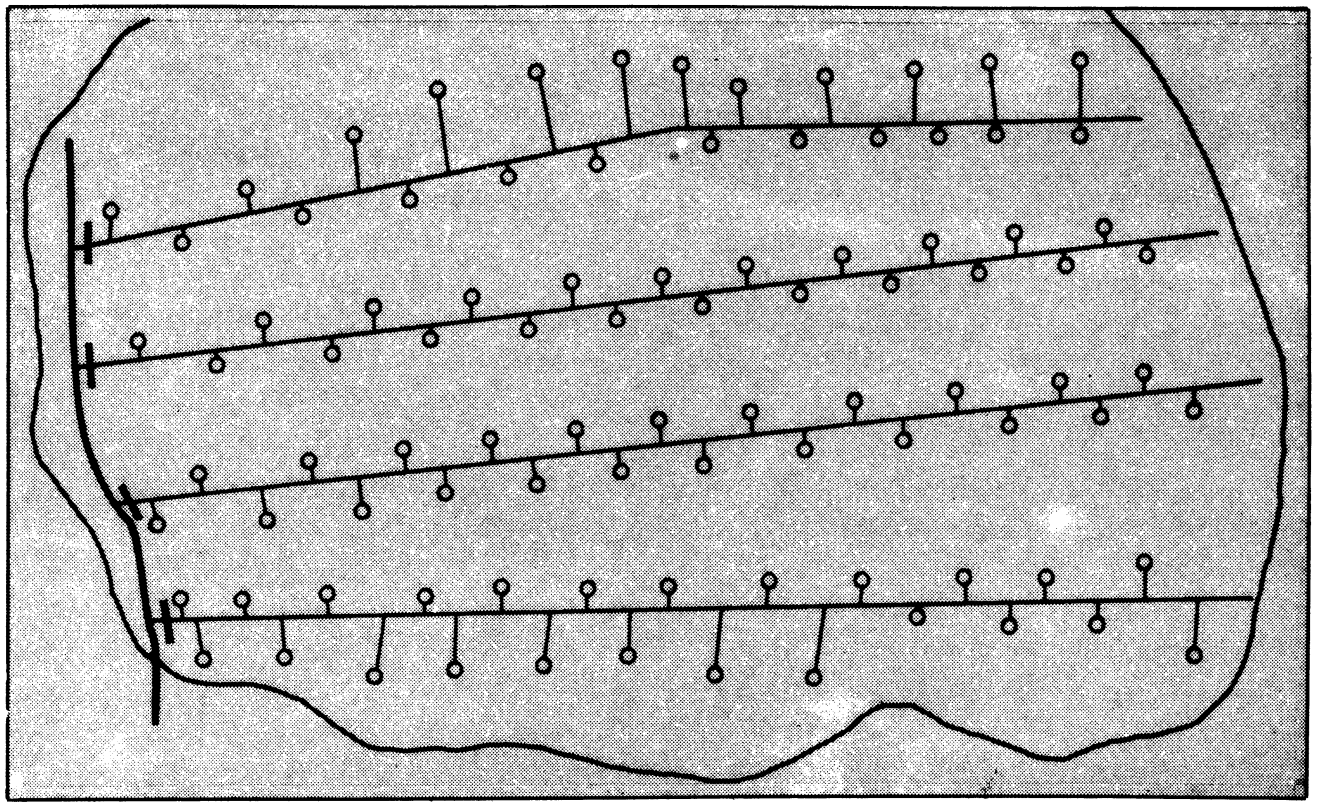
The MX Race Track System:

Rube Goldberg Complexity



Adapted from Center for Defense Information

The "Linear" or "Grid" MX System

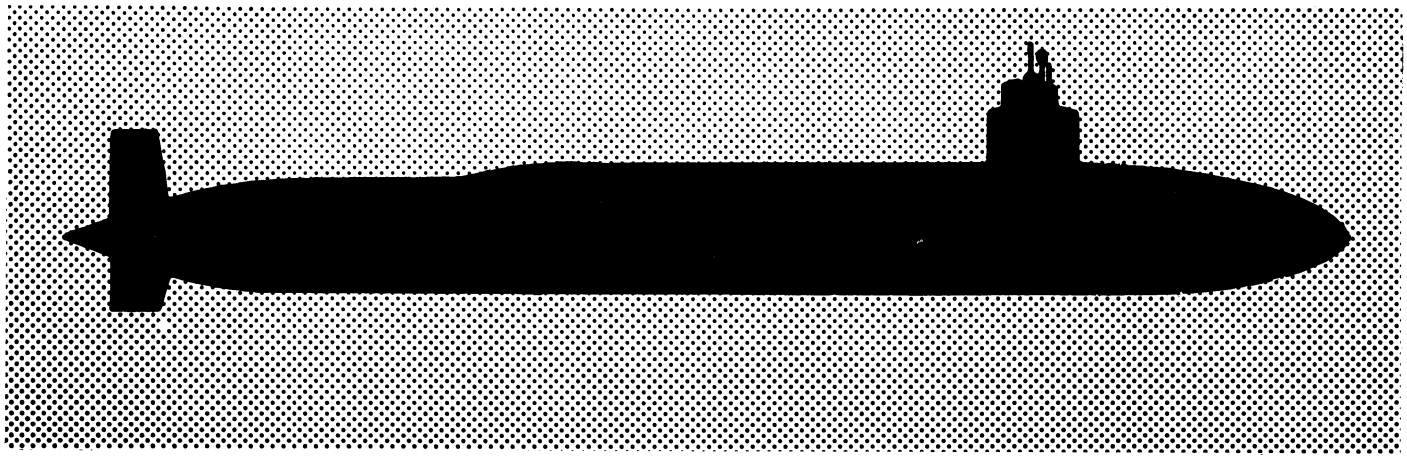


implement a counterforce strategy. The Pentagon wants to keep land-based ICBMs because command and control is easier, so that they can be used for limited nuclear exchanges. Otherwise it would be entirely possible for the U.S. to turn away from the triad and go to a diad of air and sea-based weapons.

The effort to preserve the triad with M-X comes at a tremendous cost. The Air Force has set the price of 200 M-X missiles in the "linear" basing mode at $32 billion in 1980 dollars for construction and operation. A recent General Accounting Office report put the price tag at $60 billion, and Senator Proxmire has predicted a total cost of $100 billion. More important, however, is the environmental impact. M-X will take up something over 24,000 square miles of public land in Utah and Nevada, an area five times the size of the state of Connecticut. The Air Force has said that all but the area immediately around the shelters would be open public use, but few are likely to take picnics down to the local M-X site. Air Force officials say that M-X will be the largest public works program in American history. Construction is expected to require 10,000 miles of new access roads alone (the entire interstate highway system totals only 40,000 miles). The water and energy the project will consume is a serious burden on that area of the country, and the Air Force may have to build a pipeline to carry in water from the West Coast.

The military arguments against the missile are just as strong. The vulnerability of fixed land-based missiles to a Soviet "counterforce" attack is a problem in theory, but in practice, neither side could count on its ability to carry out a fully effective nuclear attack on the other side's ICBMs. And M-X may not even solve the theoretical problem. According to military intelligence analysts, U.S. missiles will begin to become vulnerable to Soviet attack by 1983, when Soviet ICBM accuracy improvements are complete; but M-X will not begin to be deployed until 1986, and Defense Department experts say that until at least half are in place in 1988 the M-X will not present enough extra targets to make any difference. By the early 1990s, the Soviets could add enough warheads to their existing missiles to target all the sites anyway. Certainly, if SALT II expires in 1985, allowing the Soviets to put more than ten warheads on each of their missiles, they would be able to deploy enough warheads to overwhelm the number of M-X launch points much more cheaply than the U.S. could build additional sites. SALT III might, of course, put even stricter limits on the number of Soviet warheads, but rather than design an "M-X Preservation Treaty" it would be better to work for a treaty which would eliminate the need for counterforce weapons altogether. That would require, however, revising current U.S. strategic plans.

The M-X is, of course, a boon for the defense industry. Martin Marietta Corporation is the contractor assigned to integrate all the M-X systems and Rockwell International, Aerojet-General Division of General Tire Company and Hercules Corporation are major contractors. Eventually about 25 companies are scheduled to receive large M-X related contracts and they will funnel money to numerous subcontractors.



Trident

Submarines equipped with ballistic missiles remain the most invulnerable element of the U.S. strategic triad, and thus our most effective retaliatory force. From the military point of view, however, they have certain weaknesses. Radio communication with submerged submarines is very difficult, which limits command and control flexibility. And navigators cannot yet fix a ship's location precisely enough to give submarine launched ballistic missiles the accuracy of missiles sent up from surveyed land sites. U.S. SLBMs, therefore, cannot be used effectively as counterforce weapons. The Navy's Trident submarine program is designed in part to correct these deficiencies and turn the submarine force into a part of America's emerging counterforce arsenal.

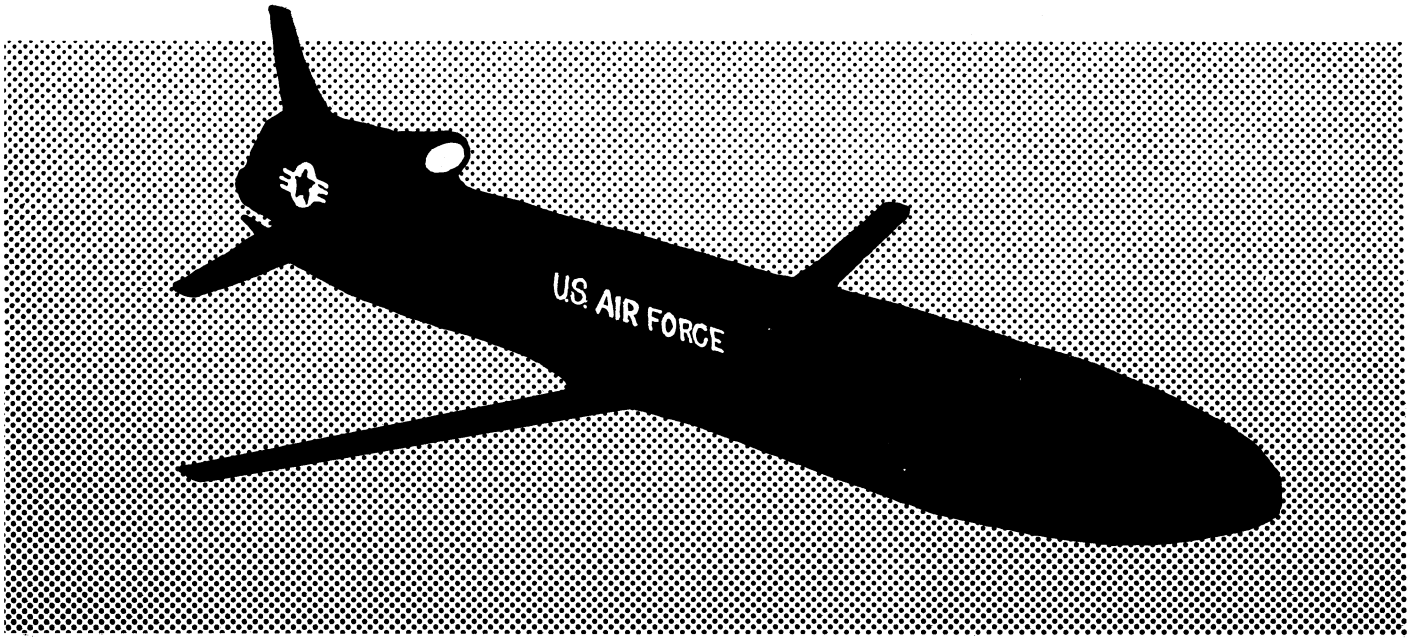
The Trident program is actually composed of three separate elements. The first is the new Trident submarine itself. 560 feet long, the Trident is the largest submarine ever built—it displaces 18,700 tons of water, as much as a large cruiser, and it is three times the size of the first U.S. Polaris missile submarines. It carries 24 missile tubes rather than the usual 16, and each missile tube is able to hold a new, much larger missile. A large part of the reason for making it so big, however, was to hold a huge, 90,000 horsepower nuclear-powered engine system designed for very high speed, though no one has ever made a case that missile submarines need to be fast.

The huge size of the ship has contributed to huge cost increases—the price of the submarine alone, without missiles, has gone from an original estimate of $793 million to $1.2 billion. This could make it impossible for the Navy to afford the 27 Tridents which would be needed in the 1990s to replace all of the U.S. Polaris and Poseidon submarines as they are retired. Currently the Navy plans 13 Tridents to be built through 1990; funds for seven have already been authorized and construction has started on five. The first submarine, the USS Ohio, was finally launched in April of 1979, over a year behind schedule, at the General Dynamics Electric Boat Division shipyard at Groton, Connecticut. It will be delivered for service in November of 1980. The first 9 or 10 Tridents will be based at Bangor, Washington.

The second part of the Trident program is the Trident I (C-4) missile, which is actually just an updated version of current Poseidon (C-3) missiles. The Trident I will carry eight 100 kiloton warheads rather than the 10 to 14 smaller warheads on the Poseidon. This allows room for an additional rocket stage, which will increase the range of the missile to 4,000 nautical miles. Trident I-equipped submarines can therefore use much more ocean room to hide in, while still reaching Soviet targets. It is expected that by 1981 the Trident I will be able to hit within 800 feet of its target, but it still will not be effective in destroying missile silos. Besides putting them on the Trident, the Navy will backfit Trident I missiles into twelve Poseidon submarines by 1982. Lockheed Corporation in Sunnyvale, California, is the main contractor.

The most destabilizing part of the Trident program is the Trident II missile. Though it is still only in the conceptual stage, the Trident II will be a large, long range (6000 mile) missile with warheads powerful and accurate enough to destroy hardened, military targets. Most likely, this will require equipping the Trident II with "Maneuverable Reentry Vehicles" (MARVs), which can adjust their course at the very end of a flight to home into a target precisely. The most frequently discussed plan is for each Trident II to carry fourteen 150 kiloton MARVs. Trident II will begin to become available by about 1988. In the meantime the Navy is working diligently on schemes to improve communications, and it is expanding its fleet of TACOMO control aircraft. It has, however, been denied its pet project to build a low frequency radio net in northern Michigan and Wisconsin.

The Trident submarine program is so badly overpriced that it may not survive the Navy's own cost controllers, who are concerned that it will starve the rest of the Navy's shipbuilding program. The Navy is currently reviewing the possibility of building a smaller submarine still able to carry the Trident II. The only real reason for building Trident is to carry Trident II counterforce missiles—existing submarines or much smaller new ones can carry the Trident I missile, with sufficient range to keep submarine based missiles invulnerable for the foreseeable future.



Cruise Missile

The cruise missile is a small, pilotless, jet-powered missile which carries either a conventional or a nuclear warhead. In contrast to a ballistic missile, which merely falls in an arc like a football after it has been kicked, the cruise missile actually flies on wings like an airplane. Cruise missiles are nothing new—the German V-1 "buzz bomb" of World War II was a kind of cruise missile, and the U.S., Britain, France and the U.S.S.R. have long deployed shorter range pilotless missiles, some with nuclear warheads, for land and especially naval missions. The new U.S. strategic cruise missiles, however, are dramatically different from their predecessors. Because of advances in miniaturization, engine technology, and guidance systems, cruise missiles small enough to be carried in large numbers and dropped from bombers or launched from submarine torpedo tubes can deliver a powerful nuclear warhead within 100 feet of a target from 1,500 miles away.

Currently, the U.S. is developing two cruise missile versions: the Air Force/Boeing AGM-86 Air-Launched Cruise Missile (ALCM) and the Navy/General Dynamics BGM-109 Tomahawk Sea-Launched Cruise Missile (SLCM). These two versions each have been made into a number of different models. Originally Boeing designed the AGM-86A ALCM to fit the Short Range Attack Missile racks already in B-52s—the AGM-86A is 14 feet long and has a 25 inch cross-section. Its range was limited to about 650 nautical miles, however, so, to increase the range, Boeing designed the AGM-86B, which is 21 feet long and can fly about 1,350 miles. General Dynamics developed the Tomahawk cruise missile to be launched from submarine torpedo tubes. It is round, 21 inches in diameter, and 20 feet 3 inches long, including a rocket booster section to carry it out of the water and high enough for the jet engine to take over. Early in 1980 Boeing's ALCM won a "fly-off" competition with a modified version of the Tomahawk for use as the Air Force's ALCM. Boeing has been awarded a $3 billion production contract. The Tomahawk is also being developed by the Air Force in a ground launched version (GLCM) essentially identical to the submarine launched model, complete with a rocket section. The Tomahawk, like the AGM-86B, has a 1,350 mile range.

All these versions of the cruise missile incorporate the same technology. They are powered by a 130 pound fanjet engine developed by Williams Research Corporation of Walled Lake, Michigan. The guidance system was developed by McDonnell Douglas Corporation of St. Louis. Each strategic missile will carry a 200 kiloton thermonuclear warhead.

In an attack, the cruise missile flies a "high-low" profile. It starts out, after being dropped from an airplane or boosted by a rocket, at a high altitude (about 45,000 feet), and it cruises at that fuel-efficient height at half the speed of sound until it approaches enemy radar. Then it drops down to 50 or 100 feet off the ground, where it zig-zags around hills and through valleys guided by the McDonnell Douglas "Terrain Contour Matching" (TERCOM) program. TERCOM compares radar readings from features of the countryside below with stored computer maps to guide the missile along a pre-programmed flight path designed to confound enemy air defenses. TERCOM can take the missile within 100 feet of its target. The Navy has also been working on a photo-optical "Scene Matching Area Correlation" system (with the appropriate acronym, SMAC) so precise that some engineers talk about 10 foot accuracies in the future—as Barry Goldwater once said, "We could lob one right into the men's room at the Kremlin."

Cruise missiles have been presented as relatively cheap and cost effective weapons. Once in full production, each ALCM is expected to cost only a little

over $1 million and each SLCM or GLCM about $1.5 million. But already the Pentagon has spent almost $1.8 billion on cruise missile development and will spend much more on testing before full scale procurement begins. And the total program could become very expensive, due to the cost of carrier aircraft and ships. The Air Force now plans to deploy up to 20 ALCMs on each of 151 modified B-52 bombers by 1986 (a total of 173 bombers will be modified for ALCMs with 151 in service at any one time). This will bring the overall ALCM program cost to about $5 billion. Last year, however, the Air Force projected an eventual ALCM deployment of about 6,000 missiles, which means that it would have to develop and procure additional, new cruise missile carrier aircraft; probably modified wide bodied jets at $60 million each. Pentagon estimates have put the cost of the maximum cruise missile program, including carrier aircraft, ground construction and improved cruise missile designs, at up to $40 billion.

The Navy has not yet planned its procurement. The protocol to the SALT II Treaty limits deployment of SLCMs and GLCMs to tactical versions—that is, missiles with less than a 375 mile range. The protocol expires in 1981, and, though long range cruise missiles would not be ready for deployment until after that time anyway, the U.S. has stretched out SLCM development for another five years. The Navy has begun plans, however, to develop and deploy a shorter range, tactical cruise missile version. Beginning in 1981, the Pentagon plans to procure 696 Ground-Launched Cruise Missiles and 464 are to be deployed in Europe beginning in 1983. The Air Force has also contracted with several companies to begin development of an Advanced Strategic Air Launched Missile (ASALM) which would have a shorter range than the ALCM, but would be much faster and therefore, presumably, better able to penetrate Soviet air defenses.

The main problem with cruise missiles is that they make arms limitation agreements unverifiable. Because they are so small, very large numbers of cruise missiles can be produced and hidden almost anywhere. In addition, as cruise missile technology becomes widely available, they will present a tremendous problem of proliferation—any number of nations will be able to produce sizeable cruise missile arsenals.

Cruise missiles are so accurate that they are almost 100% certain to destroy any target they reach. They would be useful, therefore, in certain "limited" nuclear war scenarios and they certainly serve to lower the threshold between conventional and nuclear war. They are not, however, as destabilizing as some other counterforce weapons, first, because they are relatively slow and would take several hours to reach targets, and, second, because air defenses against cruise missiles is possible (though a full defense would be prohibitively expensive), and a few would fail to get through.

To date the U.S. record in limiting the deployment of new kinds of weapons is not very good, and the price finally has been escalation of the arms race and the further erosion of American security. Most recently, for example, the U.S. refused to consider limits on MIRVs at a time when it had a monopoly. The result, once the Soviets began MIRVing their ICBMs, was the counterforce threat to U.S. missiles. If the U.S. government now refuses to consider permanent controls on cruise missiles, the Soviet Union and other nations will soon deploy these weapons in numbers we will be unable to count. The paradox of the nuclear arms race thus will appear once again—the more arms we build, the more insecure we become.

Other Proposed New U.S. Systems

By 1985 the United States will have increased the number of nuclear warheads on its missiles and bombers to 14,000 or more, before it begins putting in place its M-X and Trident-II missiles, and before planned cruise missile deployment is completed. (Nine hundred of the total will be Mark 12A warheads on Minuteman-3s, and about 2500 will be new ALCMs.)

Even so, the Pentagon has consistently asked for a number of other new weapons systems, most notably a new manned bomber capable of penetrating Soviet air defenses, and it continues to improve existing systems. The current B-52 bomber force is constantly being upgraded, primarily with new electronics, and new engines and structural improvements have recently been made on some older models. The Pentagon believes that up-graded B-52s will be effective as penetrating bombers well into the 1990s. This year, the Pentagon has begun developing concepts for a B-52 follow-on.

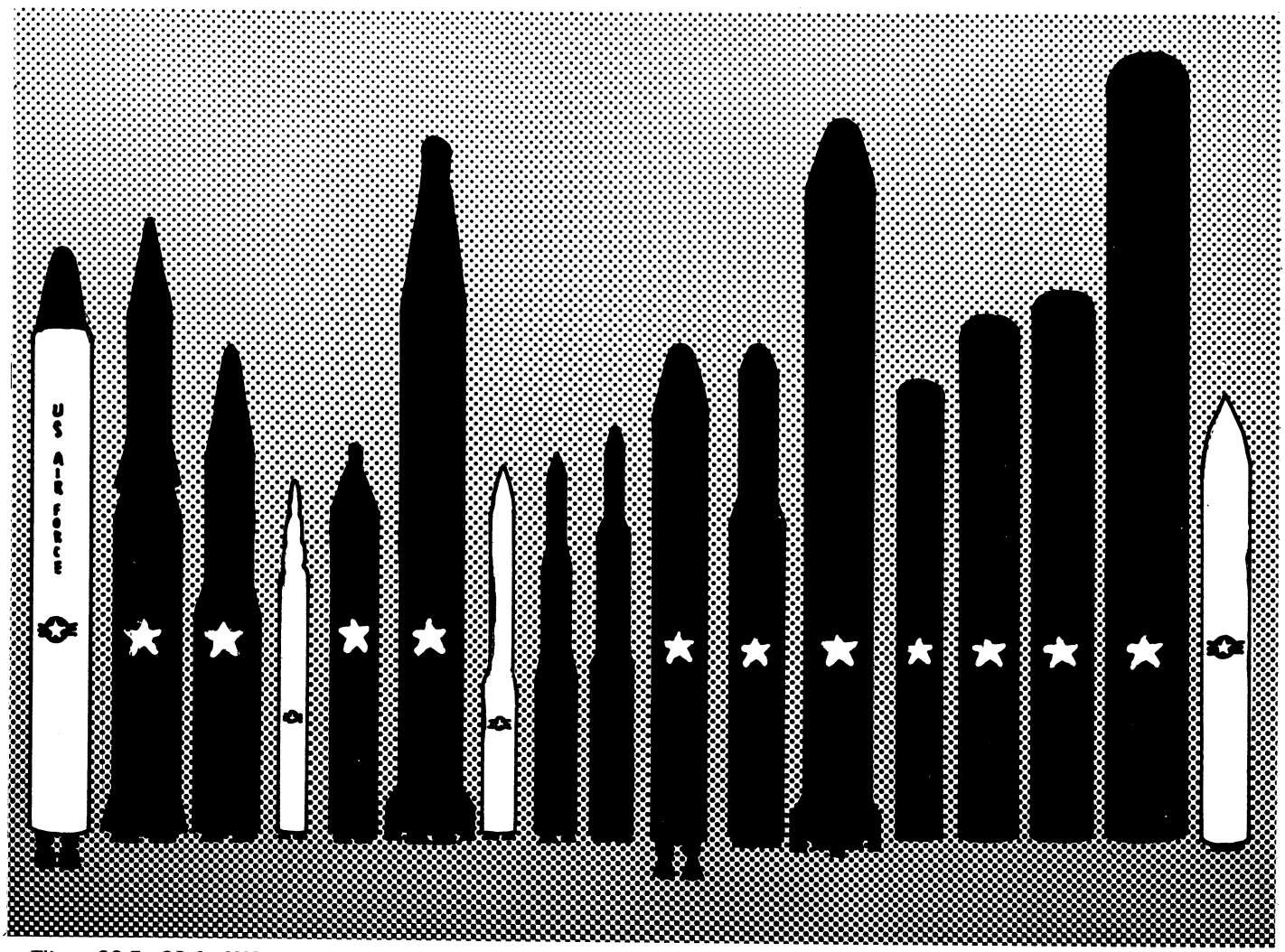
Now, however, some military officials, notably Strategic Air Command leaders, have been pressuring for immediate development of a low-altitude, penetrating strategic bomber. One plan is to "stretch" a number of FB-111As to increase their range. Another is to produce a modified B-1 Bomber with fixed rather than "swing" wings, to reduce the cost a little below that of the supersonic B-1 which President Carter canceled in 1978. So far the Administration has found these programs unnecessary.

The New Generation of Soviet Nuclear Weapons:

Soviet ICBMs

In 1949, several years before U.S. intelligence had predicted it and four years after the first U.S. explosion, the Soviet Union tested its first atomic bomb. In 1955 it produced the hydrogen bomb, a year after the U.S. In 1954, the Soviets deployed their first intercontinental bomber, in 1957 their first effective intercontinental ballistic missile (ICBM), in 1968 their first nuclear powered missile-carrying submarine, in 1975 their first MIRVed missile. Most often the Soviets have lagged a few years behind the U.S. In time, however, they have matched every single U.S.-led advance in what is called the "action-reaction" cycle of the arms race.

The new generation of Soviet land based missiles repeats this pattern—the U.S. has been putting multiple, independently targetable warheads on its missiles since 1970, and has long been improving the accuracy of its missiles. With their new fourth-generation ICBMs, first tested in 1973 and put into place in 1975, the Soviets have developed effective MIRV capabilities and have begun to approach U.S. accuracy.



Titan SS-7 SS-8 MM II SS-11 SS-9 MM III SS-13 SS-16 SS-19 SS-17 SS-18 Symbolic of Fifth Generation MX
1960-1965 1965-1970 1970-1975 UNDER DEVELOPMENT

Because the Soviets assign four competing aerospace design bureaus to producing military rockets, they tend to develop four new missiles at a time. Three new-generation missiles are now being deployed—the SS-17, SS-18, and SS-19. A fourth, the SS-16, which adds a third stage rocket booster to the intermediate-range SS-20 mobile missile, will not be produced because it would complicate verification of the SALT II agreement.

Information about Soviet missiles is necessarily somewhat unreliable. Estimates of the explosive yield of Soviet warheads, for example, are based on observation of warhead size in missile tests together with educated guesses on the capacity of the Soviets to package explosive power, given their technology. Early in 1979, the CIA substantially downgraded its estimates of the yield of new Soviet warheads for the third time in three years. In the case of the SS-18, the CIA had set each warhead at 3 megatons, then at 2 megatons, last year at 1.2 megatons, and now at 600 kilotons. The descriptions of Soviet ICBMs which follow are based on the most recent publicly available information, but may not be completely accurate.

SS-18: The SS-18 is the world's largest active military missile—118 feet long and 10 feet in diameter, it has a *throw-weight* of about 16,000 pounds. Since 1975, the Soviets have deployed about 200 SS-18s, equipping a little over half of them with 8 MIRV warheads of 600 kilotons and each of the rest with one 20-25 megaton warhead. The warheads are thought to be able, on the average, to hit within about 1500 feet (.25 nautical miles) of the target, though U.S. intelligence says that the Soviets have recently tested a new, single warhead version with 600 foot accuracy. In any case, the CIA predicts that by the early 1980s, all of the new Soviet missiles will be accurate enough to be effective counterforce weapons.

The SS-18 is a two-stage, liquid-fueled rocket. SALT II limits the Soviets to 308 large missiles, such as the SS-18 or the SS-9 which it replaces. The Soviets will have replaced all of their SS-9s with SS-18s within the next two years. SALT also limits land-based missiles to 10 warheads, though U.S. officials have estimated that with its large throw-weight, the SS-18 could carry up to 30 MIRVs.

SS-19: The mainstay of the new Soviet ICBM force is the SS-19. About 87 feet long and 9 feet in diameter, it carries six 550 kiloton warheads with current accuracy of about .25 nautical miles. By January of 1979, 310 SS-19s had been deployed.

SS-17: Each 75 foot long SS-17 carries four warheads, with about the same explosive yield as warheads on the SS-19. The SS-17 is as accurate as other new generation missiles, though it has not proved s reliable in tests. The Soviets have deployed about 100 SS-17s.

SALT II limits each side to 820 MIRVed, land-based missiles, and counts all of the new Soviet ICBMs as MIRVed. Assuming that the Soviets deploy the maximum of 308 SS-18s, they will be limited to a total of 512 SS-17s and SS-19s through 1985. They should reach this number in 1980. Together, these new generation ICBMs will carry between 3,500 and 4,000 warheads.

There are reports that the Soviets are developing a fifth generation of ICBMs, with, as usual, four new missiles on the drawing boards. SALT II, however, limits both sides to deployment of one new kind of ICBM during the period of the treaty, and this missile may be no larger than the largest existing medium sized missile—that it, the SS-19. It is likely that at least one of the new Soviet ICBMs will be designed, like the American M-X, to be deployed in some kind of mobile mode.

A Soviet Delta-class nuclear missile submarine.

Soviet Submarine Launched Ballistic Missiles

The Soviets also have been working on two new submarine launched ballistic missiles (SLBMs), and construction of new, more capable submarines of the "Delta" class is continuing. The new missiles are the SS-N-17 and SS-N-18 SLBMs. The SS-N-17 has apparently been a failure and has been fitted only onto one older "Yankee" class missile submarine. The SS-N-18 will probably be the mainstay of the Soviet SLBM force. It is currently in place on 10 Delta III submarines, and more Delta-IIIs are being built. The SS-N-18 carries three MIRVs with yields estimated at 1-2 megatons. Soviet SLBMs are not very accurate—the SS-N-18's CEP is probably no better than half a mile, which makes it ineffective as a counterforce weapon. The long range of the SS-N-18, perhaps up to 5,000 miles, allows it to be fired from waters close to the U.S.S.R. where U.S. anti-submarine warfare (ASW) is relatively limited and where Soviet forces can offer some protection. Only about 15% of Soviet missile submarines are at sea at any one time, however, and U.S. ASW techniques have made great strides recently, which makes the Soviet SLBM force vulnerable to attack. The SS-N-18 also can be fired from submarines in port, though such submarines are easy targets.

Other New Soviet Programs

The Soviets do produce cruise missiles—some are now deployed on several old submarines and on surface ships and others have been tested on airplanes. Almost all are for naval missions, and only one model and a new successor can go over 70 miles. The longer range systems are very large (almost the size of a small fighter plane), and have relatively primitive guidance systems—the newest model is effective only for a 300 mile range. No information is publicly available about Soviet efforts to develop strategic cruise missiles comparable to the new American designs.

There is some evidence that the Soviets are working on a new long-range bomber.

The New Generation at a Glance

Weapon	*Date of Deployment*	*Payload*	*CEP*	*Single Shot Kill Probability*	*# Planned*
Minuteman-3	1981	3 x 350 kt	600 ft.	.72	300
w/Mk 12A warhead	1985	3 x 350 kt	300 ft.	.98	300
M-X	1986	10 x 350 kt	300 ft.	.98	200 by 1990
		10 x 500 kt	300 ft.	.99	200 by 1990
Trident I	1981	8 x 100 kt	1500 ft.	.10	176
Trident II	1988	14 x 150 kt	300 ft.	.92	456
ALCM	1981	1 x 200 kt	100 ft.	.99+*	2400 to 3000 by 1986
SS-17	1979	4 x 550 kt	1500 ft.	.25	100
	1983	4 x 550 kt	600 ft.	.81	150
SS-18	1979	8 x 600 kt	1500 ft.	.27	200
	1983	8 x 600 kt	600 ft	.83	308
SS-19	1979	6 x 550 kt	1500 ft.	.25	310
	1983	6 x 550 kt	600 ft.	.81	360
SS-N-18	1979	3 x 1Mt (?)	3000 ft.	.15	144
	future	3 x 1Mt (?)	1500 ft.	.35	(?)

**Not useful against "time urgent targets."*

Abbreviations: KT: Kilotons Mt: Megatons CEP: Circular Error Probable

Assessing U.S. and Soviet Counterforce Capabilities

The ability of an individual nuclear warhead to destroy an enemy missile in its protective concrete silo depends both on the accuracy of the warhead and on its explosive power. Accuracy is the most important factor—doubling the accuracy of a warhead increases its ability to destroy a target just as much as increasing the explosive power by eight times (this is because the blast effect goes off in three dimensions).

U.S. and Soviet counterforce systems now being deployed—Mark 12A warheads on the Minuteman-3 and the new generation of Soviet ICBMs—are equally capable of destroying any target they reach. Slight Soviet advantages in warhead size are offset by better U.S. accuracy. Other factors, like readiness and reliability, favor the United States. In the short term, however, the Soviets will deploy many more of these weapons—the U.S. plans 900 Mark 12A warheads, while the Soviets will soon have almost 4,000 warheads on their new ICBMs.

Does this mean, as some complain, that the Soviets have a significant advantage in strategic nuclear power, which they might use to make America back down in a military crisis? Or will the Soviets be emboldened to challenge U.S. interests around the globe? Many people in the Congress and in the public as a whole fear that this is the case, or are at least uncertain enough about it to want to take no chances. Their support for the new generation of nuclear weapons in the U.S. springs from their fears. The strength of sentiment for the M-X especially, despite its knowledged expense and environmental damage, reflects concern about the vulnerability of the Minuteman force to the new Soviet ICBMs.

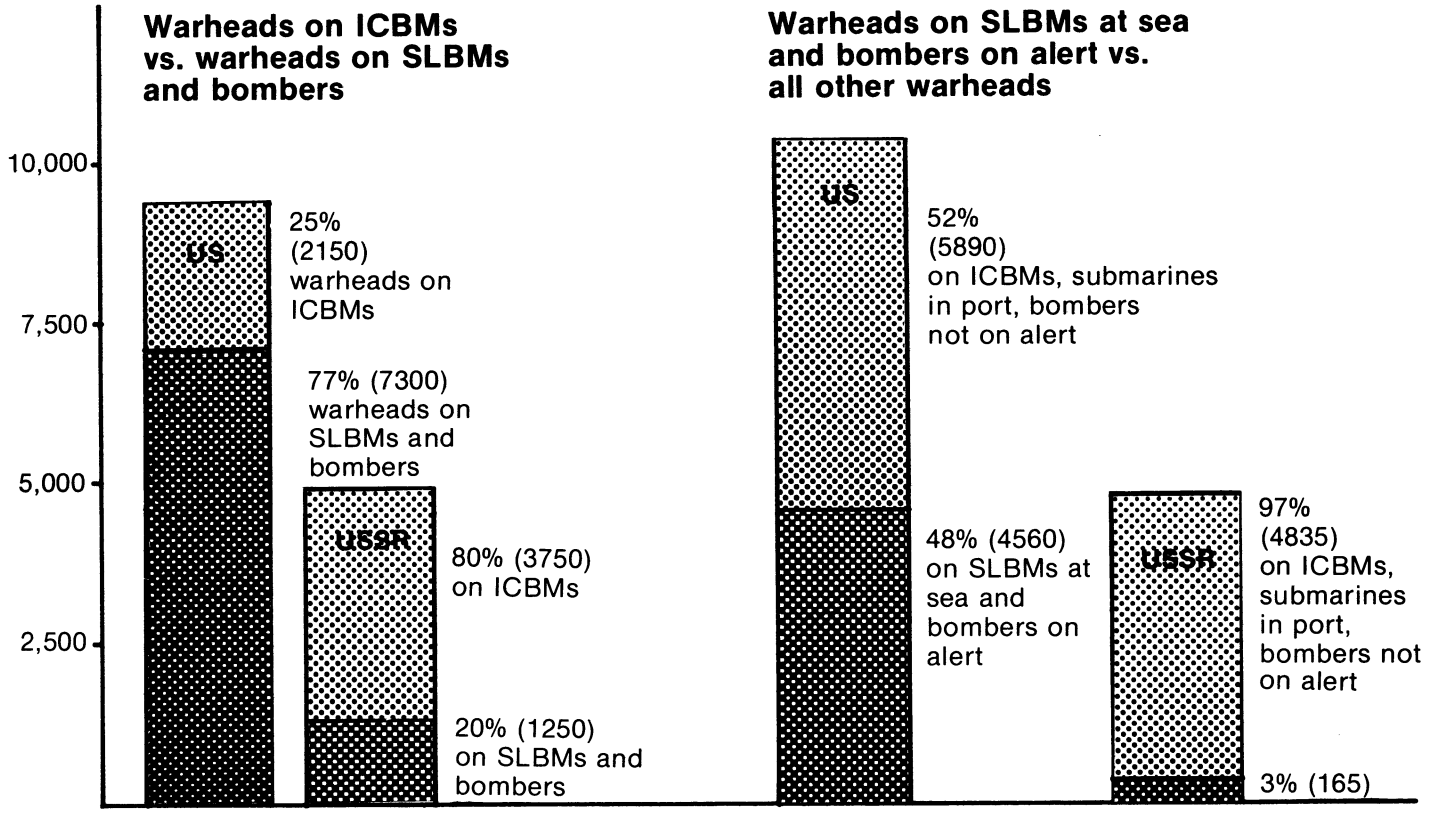
It is very difficult to address these fears, for even while they are very vague, they have deep roots. Americans distrust Soviet intentions and are disposed always to assume the worst. More than that, it is difficult for Americans to accept even apparent U.S. inferiority in military power, however abstract the measure used. Even official U.S. military planning statements have argued that U.S. forces should not be allowed to be perceived as inferior, whatever the real balance may be. In the face of this kind of argument, a realistic assessment of the strategic balance seems almost beside the point. Nonetheless, it should be made because it is the only proper basis for U.S. policy. The principal elements of such an analysis include the following:

1) The military balance depends not only on the relative offensive strength of the two sides, but also on each side's vulnerability to attack. Because Soviet forces are more exposed to pre-emptive attack than U.S. forces, the smaller U.S. counterforce arsenal is in fact *more* threatening to the Soviets than their larger arsenal is to us. The Soviets rely much more heavily than we do on theoretically imperiled land-based missiles—over two-thirds of their strategic warheads are on ICBMs versus less than 25% for the United States. Even more significant, because Soviet missile submarines are on patrol only 15% of the time, versus 55% for U.S. submarines, most of the Soviet SLBM force could be destroyed in port. The number of U.S. "counterforce" warheads is currently not large enough to threaten the entire Soviet missile force, though it is sufficient to threaten (again only theoretically) all of the new generation Soviet missiles, and submarines can be attacked with older U.S. missiles in any case. But a U.S. attack could, in theory, leave the Soviets with a far smaller strategic reserve than the U.S. would have after absorbing any conceivable Soviet first-strike.

2) Advocates of an American strategic build-up argue that the Soviets could destroy U.S. land-based missiles with only a small portion of their own nuclear force and then deliver a political ultimatum to the United States, believing that their remaining forces would deter American leaders from ordering any response. But the U.S. nuclear arsenal is so strong that no attack on U.S. ICBMs could significantly reduce its destructive power. A single U.S. missile submarine now can destroy 160 targets in the U.S.S.R., and U.S. submarines remain invulnerable. To expect that the United States would fail to respond to an attack which killed from five to twenty million Americans is incredible. Because of this, it is impossible to conceive of circumstances under which a Soviet attack on U.S. land-based missiles would gain any political advantages worth the risks involved, and there is no evidence that the Soviets believe otherwise.

3) Only the U.S. and not the Soviet Union has the capacity to approach a disarming first-strike capability. Soviet anti-submarine capabilities are not sufficient to endanger the U.S. SLBM force to any significant degree, while improvements in U.S. technology have made it possible to locate almost all Soviet submarines. The further development of U.S. counterforce capabilities should be constrained, therefore, in order to avoid creating an atmosphere of distrust which would endanger peace.

Percentage of US and Soviet Forces Vulnerable to Attack



Source: Center for Defense Information

Conclusion

The most enduring myth of the arms race is that more nuclear weapons make us more secure. The action-reaction cycle of the arms race, by which each side matches the programs of the other, has long made that notion suspect. Even while the U.S. nuclear arsenal has grown more and more powerful, the United States itself has never been more vulnerable to destruction from growing Soviet nuclear strength. The development of counterforce weapons undermines the myth in another way. The more threatening the American counterforce arsenal is to the Soviet Union, the more likely the Soviets are to act in a crisis by using their nuclear weapons first, before they can be destroyed in the ground. A world in which the superpowers take deadly aim at each other with weapons which threaten to leave the other side unable to retaliate, is a world of dangerous anxieties and some very itchy trigger fingers. Whatever the Soviet Union does, therefore, the United States is more secure without a vast new counterforce arsenal.

But what about the Russians? Haven't they been building up their own counterforce arsenal, and isn't that threatening to the United States? Don't they seem to be seeking military superiority? Can the United States afford to stand still and let the military balance turn against it? There is no doubt that the Soviet Union has invested heavily in recent years in building up its strategic nuclear arsenal. And it has made a lot of progress—its new land-based missiles are very threatening. If the Soviets are as serious about detente as they claim to be, they will have to show some sensitivity to the negative impressions which their strategic programs create in the West.

That being said, the alarms being spread about supposed Soviet strategic advantages are wholly out of place. The United States has not been standing still in the nuclear arms race, and we are not heading toward a dangerous period of relative strategic inferiority. Quite the contrary, the pursuit of all the new weapons now on Pentagon drawing boards would be far more threatening to the Soviet Union than any programs the Soviets have on line could possibly be to us. The strategic nuclear balance is not tipping dramatically against the West. Instead, there is a great deal of room for the United States to pursue policies designed to reduce tension, control the new technologies, and prevent a new and extraordinarily dangerous stage of the arms race. And a[illegible]nber of

approaches can be used to do so: a moratorium on testing, production, and deployment of new weapons systems; broader and more far-reaching proposals in negotiations with the Soviet Union; even the use of multilateral agencies to explore limits on new arms.

To pursue this path, admittedly, will be politically difficult. Secretary of Defense Schlesinger's announcement of a counterforce doctrine in 1974 reflected growing frustration among some U.S. policymakers with the constraints on America's vast military power. And that frustration seems to have become much more widespread and even more intense since that time. Schlesinger's announcement was intended to assert that American nuclear weapons were a useful element of American power, with which any would-be enemy would have to contend. But this was either an empty bluff, or it was extraordinarily dangerous. To respond to American anxieties about changing world power relationships by rattling nuclear weapons and designing ways to make the threat of nuclear warfighting credible is the height of irresponsibility. The size of the U.S. strategic arsenal has little do to with the real problems facing the nation, and nuclear weapons are not a useful instrument of dipiomacy. Rather than let our frustrations lead us into a self-defeating pursuit of military solutions to intractable political problems, Americans must accept the limits of power and understand that the continued pursuit of a nuclear arms race makes the world more dangerous and all of us less secure.

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